# STABILITY OF PLANTS OF FRUIT CROPS TO LOW TEMPERATURES IN THE CONDITIONS OF DRY SUBTROPICS OF UZBEKISTAN

## Buriev Hasan Chutbaevich

Doctor of Biological Sciences, Professor

# Juraev Erkin Bakhtiyorovich

Doctor of Agricultural Sciences on philosophy (PhD)

## Abdullaev Saidazim Bakhtiyor Ugli,

Assistant, Tashkent State Agrarian University, Tashkent Republic of Uzbekistan E-mail: abdullayev1015@mail.ru

## **ABSTRACT**

The article highlights the literature data and the results of the experiment, conducted by the authors on the resistance of plant organs of fruit and subtropical crops to low temperatures.

**Keywords:** freezing temperature, frost resistance, transpiration, lethal temperatures, cambium, extreme condition.

#### 1. INTRODUCTION

Different organs of subtropical fruit crops are not equally adapted to relocating extreme temperatures. Thanks to transpiration, plants are better adapted to temporary overheating of air than to overheating of the soil, where the roots are powerless to cool. The most persistent are the bodies poor in water. (M. M. Krylov [3]; G. Ludegord [5]). The root freezing temperature of different fruit crops in winter varied between -5 and -18 °. (D. B. Carrick [14])

The results of the study. Some scientists, (I.I. Kuryndin [4]) also, we have established that, for half an hour, the vegetative parts of the fruit tree can withstand lower temperatures. tab. one.

Table 1.

The degree of resistance of individual organ organs of fruit trees to low temperatures

Plant	Critical temperature (0C)							
	for opening fruit crops	for flowers	For young ovaries					
Seed crops								
Malus (Malus domestica Borkh.)	-3.9	2.2	-1.7					
Pear (Perus communis L.)	-3.9	2.2	-1.1					
Quince (Cydonia ablonga Mill.)	-3.7	2.3	-1.1					
Stone fruit cultures								

Cherries (Cerasus vulgaris Mill.)	-2.2	2.2	-1.1				
Sweet Cherry (Cerasus avium L.)	-2.2	2.1	-1.1				
Peach (Persica vulgaris Mill.)	-3.9	2.8	-1.1				
Plum (Prunus domestica Mill.)	-3.9	2.2	-1.1				
Apricot (Armeniaca vulgaris Lam.)	-3.9	2.2	-0.6				
Almond (Amigdalus communis L.)	-3.3	2.8	-1.0				
Subtropical cultures							
(Olea Europea L.)	-3.3, -4.4	-3					
(Citrus sinensis L.)	-9.0	3.3	-7.1				
(Citrus limon L.)	-7.0	3.2	-5.1				
(Ficus L.)			-1.5				
(Punica granatum L.)			-1.5				
(Diospyros kaki L.)			-1.5				

From these data it is clear that the young ovary are the least stable organs against lowering the temperature. Flowers and more fruit buds are more resistant. Only cherry fruit buds are equally resistant to flowers.

## 2. LITERATURE REVIEW

I. X. Shmelev [13] found in 25 varieties of apple-two-year-olds the stem frost resistance is lower than the crowns; in the previous ratio of stability at the trunk and crown was the opposite. There are indications that poor hardening of the trunk was observed after heavy rains or irrigation at the end of summer and in autumn, after a short, cold and wet growing season, as well as during late tillage. The ratio of the frost resistance of different parts of the tree in different years, depending on meteorological conditions, can vary greatly. The main branches of the razviliny are especially easily damaged (A.O. Kizyurin [2]; U. H. Chandler [12]); apparently, these parts of the tree are hardened weaker than the others (II Tumanov [11]). The kidneys can freeze out in the winter in a resting state, as well as after they start off to grow. Leaf buds in trees are usually much more stable than fruit buds; they are approximately equal to cambium in resistance. There are, however, reverse cases where fruit buds turned out to be more leafy. Apparently, the leaf buds harden more slowly than fruit buds. Most often damaged core at the site of attachment of flower buds; with more severe damage, there is swelling of the wood. Especially often from spring frosts, fruit buds and flowers are dying in fruit trees. In the flower only the ovary can be killed; sometimes only individual flowers perish in the inflorescence. In young fruits, seeds freeze first; in such cases, the fruits usually fall off. Autumn frosts sometimes damage the ripe fruits of grapes and peaches, which are very unstable.

In the snowless winters grapes easily freeze the roots. According to the experiments of A. G. Mishurenko [6], the roots of European varieties were frozen out at -5 n -6  $^{\circ}$  C, and in American at -9 and -11  $^{\circ}$  C, and in Central Asian varieties at -13-15  $^{\circ}$  C

As pointed out by W.H. Chandler [12] in Arizona, fruiting trees endure frosts down to -14.5  $^{\circ}$  C, only the leaves and the youngest wood are damaged. In olives, the fruits were damaged at -3.3  $^{\circ}$  C and -4.4  $^{\circ}$  C, the buds froze out at -3  $^{\circ}$  C. In citrus, the least winter-hardy, differences in the resistance of different

organs of the same plant are especially pronounced. The fruits are the least resistant, the leaves are somewhat more stable and the trunks even more.

(H.L. Shirley [15]) determined the lethal temperatures for conifers and found that young trees, completely submerged in water, had fibrous roots that were killed earlier than other parts of plants. Under his experience, a 5-hour exposure to a temperature of 44.3  $^{\circ}$  C killed the roots, but did not cause much damage to the aerial parts. Different types of conifers turned out to be similar in their ability to withstand high temperatures. The least resistant woody plants differ in their roots. If in winter the above-ground parts of the apple tree are often brought down to -40  $^{\circ}$  C, then its roots die at -9 and -10  $^{\circ}$  C.

From these data it is clear that the young ovary are the least stable organs against lowering the temperature. Flowers and more fruit buds are more resistant. Only cherry fruit buds are equally resistant to flowers.

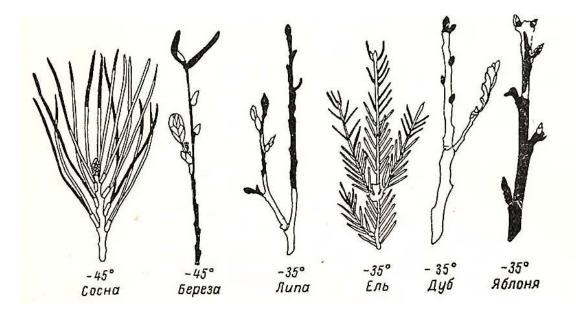
I. X. Shmelev [13] found in 25 varieties of apple-two-year-olds the stem frost resistance is lower than the crowns; in the previous ratio of stability at the trunk and crown was the opposite. There are indications that poor hardening of the trunk was observed after heavy rains or irrigation at the end of summer and in autumn, after a short, cold and wet growing season, as well as during late tillage. The ratio of the frost resistance of different parts of the tree in different years, depending on meteorological conditions, can vary greatly. The main branches of the razviliny are especially easily damaged (A.O. Kizyurin [2]; U. H. Chandler [12]); apparently, these parts of the tree are hardened weaker than the others (II Tumanov [11]). The kidneys can freeze out in the winter in a resting state, as well as after they start off to grow. Leaf buds in trees are usually much more stable than fruit buds; they are approximately equal to cambium in resistance. There are, however, reverse cases where fruit buds turned out to be more leafy. Apparently, the leaf buds harden more slowly than fruit buds. Most often damaged core at the site of attachment of flower buds; with more severe damage, there is swelling of the wood. Especially often from spring frosts, fruit buds and flowers are dying in fruit trees. In the flower only the ovary can be killed; sometimes only individual flowers perish in the inflorescence. In young fruits, seeds freeze first; in such cases, the fruits usually fall off. Autumn frosts sometimes damage the ripe fruits of grapes and peaches, which are very unstable.

In the snowless winters grapes easily freeze the roots. According to the experiments of A. G. Mishurenko [6], the roots of European varieties were frozen out at -5 n -6  $^{\circ}$  C, and in American at -9 and -11  $^{\circ}$  C, and in Central Asian varieties at -13-15  $^{\circ}$  C

As pointed out by W.H. Chandler [12] in Arizona, fruiting trees endure frosts down to -14.5  $^{\circ}$  C, only the leaves and the youngest wood are damaged. In olives, the fruits were damaged at -3.3  $^{\circ}$  C and -4.4  $^{\circ}$  C, the buds froze out at -3  $^{\circ}$  C. In citrus, the least winter-hardy, differences in the resistance of different organs of the same plant are especially pronounced. The fruits are the least resistant, the leaves are somewhat more stable and the trunks even more.

#### 3. MAIN PART

(H.L. Shirley [15]) determined the lethal temperatures for conifers and found that young trees, completely submerged in water, had fibrous roots that were killed earlier than other parts of plants. Under his experience, a 5-hour exposure to a temperature of  $44.3\,^{\circ}$  C killed the roots, but did not cause much damage to the aerial parts. Different types of conifers turned out to be similar in their ability to withstand high temperatures. The least resistant woody plants differ in their roots. If in winter the above-ground parts of the apple tree are often brought down to  $-40\,^{\circ}$  C, then its roots die at -9 and  $-10\,^{\circ}$  C



Picture 1. Frost resistance of organs and their parts of plants. Blackened parts of the plant died. (According to I. I. Tumanov and O. A. Krasavtsev)

Anatomical analysis of the shoots of olives, conducted by JI. I. Sergeev and K. A. Sergeeva [9], after considerable frosts on the southern coast of the Crimea, as well as after freezing the branches of various varieties in the refrigerator, showed that different tissues of the stem have unequal endurance to low temperatures. The most sensitive were the living tissues of the inner part of the cortex, the cambium and the core. According to their data, in many fruit trees (peach, apricot, etc.), the most sensitive to low temperatures organs are fruit buds.

Ji. I. Sergeev [9] spent the freezing of 11 different ornamental evergreen trees and shrubs. Ten branches of each breed were frozen on February 3, 1948 for 3 hours at a temperature of -14.5 ° C. After 15 days, the extent of damage to various parts of the branches was determined, which showed that with a sharp decrease in temperature in evergreen subtropical plants damage occurs to the most vital parts, where even in winter time with warming, growth begins. These organs include the buds of subtropical plants, which are not covered by protective scales and do not need a long period of low temperatures. Of the leaves, the youngest, still growing, and the oldest, located in the basal parts of the stems, showed the greatest sensitivity. The most vulnerable parts of the stems were the growth cones, in which growth begins earlier and proceeds most rapidly. In the annual shoots, the cambium and living cells of the cortex are often damaged, that is, those tissues in which the metabolism proceeds most actively even in winter and where cell division often continues.

With regard to the stability of the roots, their damage depends on the depth of soil freezing, the lighter the soil, the more usually the roots of fruit trees are damaged.

Some researchers note a more complex picture of damage in pome fruit crops. An anatomical study showed that the most vulnerable area during frosts is the "heart" of fruit, that is, the part formed from the ovary of the pistil. Histological - the study of other elements of fruit formations of pome breeds showed that damage from frost also exists in the stem. Rarely in the flower buds stamens and petals are damaged. Calyx is damaged only during severe frosts.

Experimentally established that different parts of the same fruit plant have different resistance to low temperatures. So, in winter, fruit buds freeze out more often than vegetative ones, and the core more often than cambium and growing points. The authors consider the late termination of growth to be the cause of the greatest vulnerability of the roots of fruit plants to frost.

The relatively low frost resistance of the roots can be observed in such examples, when the root system freezes out with the aerial part remaining. Damage of this type leads to the drying of plants that began to grow. Such cases are also manifested in nurseries after long autumn "black" frosts with deep freezing of the soil until snow cover is established.

It is necessary to dwell on the very thorough studies of wild tree and fruit crops by DF Protsenko and JL K. Polishchuk [7]. Both direct field and laboratory, and indirect studies of the physiological and biochemical characteristics of the frost resistance of these plants were carried out.

They found that cambium and bark are the least resistant of the various tissues of the stem and root. Severe damage to the perimedular zope in almost all the species and varieties studied by them is explained by a smaller supply of protective substances, and cambium - by more pronounced growth processes, which is especially characteristic in the fall and early spring.

In order to determine the frost resistance of the root system during winter transplants of trees in connection with the tasks of green construction, E. M. Avdoshin [1] performed the freezing of the roots of 17 species of tree species (Table 2)

Table 2. Frost resistance (0C) of the root system of some tree species (according to Avdoshin, 1959)

1707)							
Plant	S urvived	ed out	Fad	Plant	S urvived	ed out	Fad
Груша (Perus communis L.)	5	7	-6 -	Персик (Persica vulgaris Mill.)	16		-18
Айва (Cydonia	-		-10	Маслина	-		-19-
ablonga Mill.)	8	-11		(Olea Europea L.)	16	20	
Вишня	-		-13	Апельсин	-		-19
(Cerasus vulgaris Mill.)	10	-14		(Citrus sinensis L.)	17		-17
Яблоня (Malus	-		-15	Гранат (Punica granatum L.)	18		-23
domestica Borkh.)	12		-13	Инжир (Ficus L.)	9.5		-25
Черешня (Cerasus avium L.)	1 4		-16	Хурма (Diospyros kaki L.)	28		-33

Such frost resistance of the roots was observed from mid-December to the first half of March. In the spring, after thawing of the soil, the frost resistance of the roots slowly decreased and in the summer period it decreased to a minimum of ((the roots froze out at a temperature from -2.5 to -3.5 ° C).

### 4. FINDINGS

- 1. In many fruit breeds (peach, apricot, etc.), the most sensitive to low temperatures organs are fruit buds.
- 2. The buds of subtropical plants that are not covered by protective scales and do not need a long period of low temperatures.
- 3. Of the leaves of subtropical plants (olives), the youngest, still growing, and the oldest, located in the basal parts of the stems, showed the greatest sensitivity.
- 4. The frost resistance of the root system of subtropical crops in the middle of winter does not reach such a value as that of the aboveground part of the tree, because the roots, while in the ground, cannot undergo both hardening phases.

## REFERENCES

- 1. Avdoshin E.M. Frost resistance of the root system of some tree species. Physiologist. rast., 1959. v. 6, no. -1 sec.
- 2. Kizyurin A.O. hidden forms of frost and the freezing of apple trees on the vine. Garden and Garden, 1930. № 4. -C. 47-49.
- 3. Krylov M.M. To the heat engineering analysis of soil freezing and snow reclamation. Report VASHNIL, vol. 1937. 1 (4). -WITH. 52-57.
- 4. Kuryndin I.I., Malinovsky V.V., Venyaminov A.N., Belokhonov I.V., Fruit. Ed. 3rd Selkhozgiz, 1946. M. -S. 23-24.
- 5. Lundegord G. Influence of climate and soil on plant life. Selkhozgiz, 1937. M. -C.14-21.
- 6. Mishurinko A.G. Development of methods for the comparative evaluation of the cold resistance of the vine. Ukr. inst. viticulture them. V.Ye.Tairova, 1935. vol. 7. -C. 111-112.
- 7. Protsenko D.F. and Polishchuk LK. On the effect of low temperatures on the physiological processes in some greenhouse plants. Nakovi zap. KDU im. Shevchenko T.G., V. 7, vip. 1948. -6 p.
- 8. Radchenko S.I. Temperature gradients of the environment and plants. Moscow. ed. The science. 1966. C-387.
- 9. Sergeev L.I. and Sargeeva K.A. .. Anotomical and physiological characteristics of olive leaves in connection with its persistence. 1947. DAN USSR, t. 57, No. 7. -C. 56-59.

- 10. Tumanov I.I. and Krasavtsev, OA. The resistance of woody plants to wood. Physiologist. rast., 1955. t. 2, no. 4. -C. 43-47.
- 11. Tumanov I.I. Physiological basis of winter hardiness of cultivated plants. Selkhozgiz, 1940. M. L. -C. 64-67.
- 12. Chandler U. X. Fruit. Selkhozgiz, 1935. M. L.-C-122-130.
- 13. Shmelev I. Kh. Morostability of fruit trees and methods for its determination. Tr. on top bot., genet. and selection, 1935. gray. 3, No. 6. -C-60-65
- 14. Carrick D. B.. Resistance of the roots of some fruit species to low temperature. Cornell. Agr. Exp. Sta., 1920. Mem. -36 p.
- 15. Shirley H.L. Lethal high temperatures for conifers and the cooling effect of transpiration. J. Agr., 1936. Res., -53 p.